

MORPHOMETRIC TRAIT CHARACTERISTICS OF WEST AFRICAN DWARF GOATS IN ABIA STATE, SOUTH EAST NIGERIA

V.N. Ebegbulem¹, S.N. Ibe², P.O. Ozung¹ & J.A. Ubua³

¹Department of Animal Science, University of Calabar, Calabar – Nigeria, ²Department of Animal Production Technology, Michael Okpara University of Agriculture, Umudike, ³Department of Agric. Education, CRS College of Education, Akamkpa

ABSTRACT

This study was carried out to investigate the Morphometric Trait Characteristics of West African Dwarf (WAD) Goats in five Local Government Areas of Abia State. A total of One Hundred & Twenty Three (123) WAD goats (33 bucks and 90 does) were randomly sampled from local farmers in the area (Umuahia – South, Isiala – Ngwa North, Ikwo, Isuikwuato and Ukwu East LGAs). The study lasted two consecutive months and the experimental animals were raised semi-intensively and fed with fresh green forages and kitchen wastes. Drinking water was provided *ad libitum*. Goats between the ages of less than a year and four years were used based on their dentition. The body weight and linear body measurements were determined using a hanging scale and tailor's tape respectively. The following linear body measurements (LBMs) were taken: Withers Height (WH), Rump Height (RH), Rump Width (RW), and Body Length (BL). Others include Heart Girth (HG), Neck Circumference (NC), Face Length (FL), Neck Length (NL), Ear Length (EL) and Foreleg Length (FLL). Results obtained showed that BWT, RH and HG of WAD goats were significantly ($p < 0.05$) affected by age of the animals. Sex of goats recorded no significant ($p > 0.05$) influenced on all morphometric traits studied. In all parameters studied, Does were superior to Bucks. Based on this study, it is established that Morphometric characteristics of WAD goats are affected by age and sex of the animals.

Key words: Morphometric, trait, West African Dwarf Goats, age, sex.

INTRODUCTION

Over the years, goats have provided mankind with useful products like meat, milk and skin. Goats are unique in subsistence animal husbandry on account of their adaptability to harsh environmental conditions and catholic taste for common and local feedstuffs, mostly roughages and plant by-products. The West African Dwarf goats in particular have been reported to be trypanotolerant, hence their huge population in Southern Nigeria.

The total world population of goats has been estimated as 625 million (FAO, 1995). But in Africa, goat population is about 171 million and 22 million in Nigeria (representing about 31% of the world total) (FAO, 1991). According to Osinowo *et al.* (1992), there are three indigenous breeds of goats in Nigeria – Red Sokoto (50% abundance), West African Dwarf (45% abundance) and Sahel (5% abundance). The Red Sokoto and Sahel breeds are predominantly found in Northern savanna and Sahel areas respectively (Ngere *et al.*, 1984), while the West African Dwarf breed is common in the humid forest zone of Southern Nigeria (Bayer, 1986).

A system of linear body measurement was developed by Alderson (1999) to provide an assessment of type in beef cattle and overall value of an animal. This is useful as a measure in young animals to enable earlier assessment of breeding animals for selection and to predict mature rating. Variation in body size is one of the criteria used in classifying breeds of goats (Devendra and Burns, 1983). The linear body measurements in different livestock species have been studied. For instance, Jeffery and Berg (1972) reported that at maturity, linear body measurements are essentially a constant reflecting heritable size of the skeleton. Linear body measurement has also been studied to

demonstrate the effect of cross breeding and as a criterion for selecting replacement stock of animals and for evaluating breeds in a controlled environment (Shrestha *et al.*, 1984; Searle *et al.*, 1989 & Sharma *et al.*, 1977).

Ngere (2006) made a comparative study of the structural variation between Red Sokoto goat and WAD goat based on linear body measurements. The relationship existing among linear body traits provide useful information on performance, productivity and carcass characteristics of farm animals. Besides, bodyweight and linear body measurements of meat animals have been found useful in quantifying body size and shape (Ibe, 1989; Ibe and Ezekwe, 1994). The quantitative measurements for size and shape are necessary for estimating genetic parameters in animal breeding programmes (Chineke, 2000).

This study was therefore aimed at determining the Morphometric trait characteristics of WAD goats that thrive in Southern Nigeria, so as provide useful information on carcass and other characteristics of this breed of goats.

MATERIALS AND METHODS

Experimental Site:

This study was carried out in five Local Government Areas of Abia State, namely: Umuahia – South, Isiala – Ngwa North, Ikwuano, Isuikwato and Ukwa East. The state is located in the humid ecological zone of Nigeria with distinct wet and dry seasons.

Experimental Animals and Management:

A total of One Hundred and Twenty Three (123) WAD goats aged between < 1 and 4 years were randomly selected from flocks in the study area. Of this number, 33 bucks and 90 does were used, the lower number of bucks was due to the fact that bucks beyond one year old were usually sold or slaughtered. The study lasted two months and throughout this period the animals were raised under the semi – intensive system of management, where fresh green forages as well as kitchen wastes were the major feeding stuffs. Drinking water was provided *ad libitum*. The ages of the WAD goats were estimated based on their dentition (Sastri and Thomas, 1976) and arranged into groups as follows:

No. of teeth	Age in years	Age group
Milk teeth	< 1	i
2 teeth	1	ii
4 teeth	2	iii
6 teeth	3	iv
8 teeth	4	v

Method of Data Collection:

The body weight (Kg) of the WAD goats was taken using a hanging scale and sack. The linear body measurements taken were: Withers height (WH), Rump height (RH), Rump width (RW), Body length (BL), Heart girth (HG), Ear length (EL), Fore leg length (FLL), Face length (FL), Neck length (NL) and Neck circumference (NC). The linear body measurements (cm) were taken using a tailor's measuring tape. Each goat was adequately restrained in a natural position as possible and each body dimension taken in duplicates in the nearest centimeters and the mean recorded.

Statistical Analysis:

Data collected were subjected to Analysis of Variance (ANOVA) for Randomized Complete Block Design (RCBD) and where significant effects were recorded, means were separated using the Duncan Multiple Range Test (DMRT) as described by Steel and Torrie (1980).

RESULTS

Table 1.0 shows the bodyweight (BWT) and Linear Body Measurements (LBMs) (Mean \pm S.E) of WAD goats based on sex difference. All traits were not significantly ($p > 0.05$) affected by sex of the goats. Females (does) had numerically higher mean values for Body weight (BWT), Rump height (RH), Body length (BL), Heart girth (HG),

Face length (FL) and Ear length (EL). The males (bucks) showed numerically higher values for Neck length (NL) and Foreleg length (FLL) than those recorded for does.

Table 1.0: Body weight (BWT) and LBMs of WAD goats based on sex (Mean \pm S.E)

Trait	Sex	
	Bucks (N = 33)	Does (N = 90)
BWT (Kg)	13.46 \pm 0.54	13.91 \pm 0.27
Linear body measurements (cm):		
RH	40.00 \pm 0.39	40.42 \pm 0.20
RW	10.15 \pm 0.27	11.53 \pm 0.14
BL	38.94 \pm 0.98	41.33 \pm 0.50
HG	50.42 \pm 0.95	51.78 \pm 0.12
NC	23.35 \pm 0.40	22.21 \pm 0.20
FL	15.35 \pm 0.24	15.47 \pm 0.12
NL	12.92 \pm 0.48	12.83 \pm 0.24
EL	8.99 \pm 0.19	9.18 \pm 0.09
FLL	25.94 \pm 0.35	25.18 \pm 0.18

Means are not significantly ($p > 0.05$) different between Bucks and Does of WAD goats.

Table 2.0 shows the different Morphometric parameters of WAD goats based on age. Some parameters recorded significant differences ($p < 0.05$) with respect to age of the animals. Body weight increased from 11.00 \pm 0.84 – 18.00 \pm 0.99 Kg from <1 – 4 years of age respectively. All other traits followed a similar trend of marginal increase in values with age of WAD goats.

Table 2.0: Morphometric Traits of WAD Goats based on Age (Mean \pm S.E)

Trait	Age Bracket (Years)				
	<1	1	2	3	4
BWT (Kg)	11.00 \pm 0.84 ^a	11.15 \pm 0.40 ^a	13.30 \pm 0.46 ^b	16.55 \pm 0.39 ^c	18.00 \pm 0.99 ^c
Linear measurements (cm):					
RH	38.00 \pm 0.61 ^a	38.46 \pm 0.29 ^a	40.37 \pm 0.33 ^b	41.65 \pm 0.28 ^b	45.33 \pm 0.72 ^c
RW	9.71 \pm 0.42	10.16 \pm 0.20	10.84 \pm 0.23	12.21 \pm 0.19	13.83 \pm 0.50
BL	37.14 \pm 1.53	37.71 \pm 0.73	39.69 \pm 0.84	44.03 \pm 0.71	46.83 \pm 1.80
HG	45.29 \pm 1.47 ^a	48.65 \pm 0.70 ^a	51.44 \pm 0.81 ^a	54.23 \pm 0.69 ^{ab}	57.33 \pm 1.74 ^b
NC	20.14 \pm 0.62	21.39 \pm 0.30	22.13 \pm 0.34	23.98 \pm 0.29	24.67 \pm 0.74
FL	14.14 \pm 0.38	14.84 \pm 0.18	15.38 \pm 0.21	16.00 \pm 0.18	17.33 \pm 0.44
NL	11.57 \pm 0.75	11.10 \pm 0.36	13.38 \pm 0.41	14.03 \pm 0.35	14.83 \pm 0.88
EL	8.57 \pm 0.29	8.78 \pm 0.14	9.14 \pm 0.16	9.44 \pm 0.14	9.83 \pm 0.35
FLL	25.14 \pm 0.54	25.03 \pm 0.25	25.44 \pm 0.29	26.60 \pm 0.25	25.68 \pm 0.63

a, b, c: means on the same row with different superscripts are significantly different ($p < 0.05$).

DISCUSSION

The non significant ($p > 0.05$) effect of sex of WAD goats on all Morphometric traits recorded in this study (Table 1.0) could be attributed to the fact goats in the humid ecological zone may have similar Morphometric traits in view of adaptability to the environmental conditions prevailing in the area. Further research is advocated to clearly buttress the above fact, since these findings are at variance with the report of Abdullah *et al.* (2004) with WAD goats in the derived savanna zone of Nigeria, in which sex significantly ($p < 0.01$) influenced all body parameters. Results in this present study show higher numerical mean values for BWT, RH, BL, HG, FL and EL for Does than Bucks. However, Adewunmi *et al.* (2008) reported higher mean values for BWT in rams than ewes. This disparity could be due to species difference between WAD goats and sheep. The superiority of Does to Bucks in this study corroborates the reports of Abdullah *et al.* (2004) in WAD goats and Katongole *et al.* (1996) in Tswana goats. Similar trends were reported in Southern Nigeria with WAD goats (Ifut, *et al.*, 1991) and in Northern Guinea Savanna of Nigeria with Red Sokoto goats (Akpa, *et al.*, 1998). Sex related differences in morphometric traits might

be partly due to androgens (e.g. testosterone) which are not released in sires (male animals) until the testes are well developed and which are known to have growth and weight – stimulating effects (Frandsen and Whitten, 1981). The higher mean values of the RW in does as compared to bucks may be as a result of developed pelvic girdle, which is an adaptive feature of dams (female animals) for parturition. This finding is in agreement with the reports of Ngere (2006) and Idowu (2002) in Red Sokoto goats.

All linear body measurements and body weight of WAD goats increased marginally with age in this study (Table 2.0). The Body weight (BWT), Rump height (RH) and Heart girth (HG) differ significantly ($p < 0.05$) with age of the animals. This result is in agreement with Salako (2004) who reported that HG and BWT are environment – sensitive and therefore increase with age. All other traits recorded no significant difference ($p > 0.05$) with respect to age. The Fore leg length (FLL) showed no significant increase from age less than 1 to 4 years. This trend is expected because Salako (2004) stated that FLL is one of the body parameters that are regarded as indicators of inherent body size, and reach about 80% of the expected adult size in less than a year. Furthermore, different values for BWT and LBMs have been reported by Abdullah *et al.* (2004) for WAD goats at the same age brackets. This disparity could be attributed to differences in ecozones in which the different studies were carried out.

CONCLUSION AND RECOMMENDATIONS

Based on the findings of this study, it is concluded that Does are superior to Bucks based on their morphometric traits. The age of WAD goats influenced the body weight and all linear body measurements in a positive manner.

It is therefore recommended that the indigenous WAD goat should be genetically modified to provide comparable morphometric traits with the exotic breeds. Further research is necessary in various locations in Southern Nigeria and other ecological zones in the country to provide a comprehensive study and data on the morphometric traits of small ruminant animals.

REFERENCES

- Abdullah, A.R., Ojedapo, L.O., Adedeji, T.A., Olayeni, T.B. and Adedeji, S.O. (2004). Body Conformation Characteristics of West African Dwarf Goats in the Derived Savanna Zone of Nigeria. *Tropical Journal of Animal Science* 7 (2): 95 – 100.
- Adewunmi, O.O., Chineke, C.A., Alokun, J.A. and Onine, C. (2008). Weight and Linear Body Measurement of Yankassa, West African Dwarf Sheep and their Crosses. Proceedings of 33rd Annual Conference of NSAP, held in Ogun State. Pp.3-6.
- Akpa, G.N., Duru, S. and Amos, T.T. (1998). Influence of Strain and Sex on Estimation of within age – group bodyweight of Nigerian Maradi goats from their linear body measurements. *Tropical Agriculture (Trinidad)* 75 (4): 462 – 467.
- Alderson, G.L.H. (1999). The development of a system of linear measurements to provide an assessment of type and function of beef cattle. *Animal Genetic Resources Information*, 25: 45 -55.
- Bayer, W. (1986). Traditional Small Ruminant Production in the Sub –humid Zone of Nigeria. Proceedings of the second ILCA / NAPRI Symposium held in Kaduna, Nigeria, 29th Oct. – 2nd Nov., 1986.Pp. 141 – 166.
- Chineke, C.A. (2000). Characterization of Physical Body Traits of Domestic Rabbits in Humid Tropics. Book of Proceedings, 25th Annual NSAP Conference held at Michael Okpara University of Agriculture, Umudike, 19 – 23, March, 2000. Pp. 237 – 238.
- Devendra, C. and Burns, M. (1983). Goat Production in the Tropics. 2nd Edition, Farnham Royal Commonwealth Agricultural Bureau, UK. Pp.60.
- F.A.O. (1991). Livestock and Livestock Products. *Quarterly Bulletin of Statistics*, Food and Agricultural Organization, FAO, Rome, Italy. 4(3): 39.

- F.A.O. (1995). Food and Agricultural Organization. *Quarterly Bulletin of Statistics*, FAO, Rome, Italy. Vol.8, No. 2, 3 & 4.
- Frandsen, R.D. and Whitten, E. H. (1981). Anatomy of the Male Reproductive System: In Frandsen, R.O. (ed.) *Anatomy and Physiology of Farm Animals*, 3rd Edition, Lea and Febiger, Philadelphia. Pp. 430 – 442.
- Ibe, S.N. (1989). Measurement of Size and Conformation in Commercial Broilers. *Journal of Animal Breeding and Genetics*, 106: 461 – 469.
- Ibe, S.N. and Ezekwe, A. G. (1994). Quantifying Size and Shape Difference between Muturu and N'dama breeds of Cattle. *Nigerian Journal of Animal Production*. 21: 51 – 58
- Idowu, A. B. (2002). Linear Body Measurement of Red Sokoto Goats. M.Sc. Thesis, Department of Animal Science, University of Ibadan, Nigeria.
- Ifut, O.J., Essien, A.I. and Udo, D. E. (1991). The Conformation Characteristics of Indigenous Goats reared in Southern Tropical Humid Nigeria. *Beitr. Trop. Landwirtschaft. Vet. Med.*, 29: 215 – 222.
- Jeffery, H. B. and Berg, R. J. (1972). An Evaluation of Several Measurements of Beef Cow Size as related to Progeny Performance. *Canadian Journal of Animal Science* 52: 23 -37.
- Katongole, J.B.D, Sebolai, B. and Madimabe, M.J. (1996). Morphological Characterization of the Tswana goat. In: S.H.B. Lebbie and E. Kagwini (eds.), *Small Ruminant Research and Development in Africa*. Proceedings of 3rd Biennial Conference of the African Small Ruminant Research Network, UICC, Kampala, Uganda, Pp.5-9.
- Ngere, L. O., Adu, I. F. and Okubanjo, I. O. (1984). The Indigenous goat of Nigeria. FAO/ UNEP Animal Genetic Resource Information. Food and Agricultural Organization of the United Nations, Rome, Italy. 3:1-9.
- Ngere, L.O. (2006). A Comparative Study of Structural Variation between Red Sokoto and West African Dwarf Goats in Southwest Nigeria. M.Sc. Thesis, Department of Animal Science, University of Ibadan, Ibadan, Nigeria.
- Osinowo, O. A., Olorunju, S. A.S., Otehere, E.O. and Arigi, L.A. (1992). Relationship between Chest girth and Live weight in Y'ankassa Sheep and Red Sokoto Goats. *Journal of Animal Production Research* 12 (2): 69 – 71.
- Salako, A. E. (2004). Maturity Rate of Some Morphometric Traits in the West African Dwarf Sheep of Nigeria. *Trop. J. Anim. Sci.* 7(1): 51 -55.
- Sastry, N. S. R. and Thomas, C. K. (1976). *Farm Animals Husbandry*. New Delhi, India. Vikas Publishing House, PVT Ltd. Pp. 29 -45.
- Searle, T.W., McGraham, N. and Donnelly, J.B. (1989). Breed and Sex Differences in Skeletal Dimensions of Sheep in the First Year of Life. *Journal of Agricultural Science* 113: 349 – 354.
- Sharma, S. K., Bhat, P. P., Bhat, P. N. and Garg, R.C. (1977). Effect of Genetic and Non – genetic factors of Pre-weaning and Body Measurements in Muzaffarnagri Breed of Sheep and its Crosses with Corriedale. *Indian Journal of Animal Science* 46: 529 – 533.
- Shrestha, J.N. B., Heawey, D.O., Fisher, P. S. and Largoord, G. A. (1984). Influence of Breed, Birth – date, Age and Body weight on Linear Body Measurements of Growing Rams maintained in a controlled Environment. *Canadian Journal of Animal Science* 64: 279 – 291.

Steel, R.G D. and Torrie, J. H. (1980). Principles and Procedures of Statistics, Biometric Approach, 2nd Edition, McGraw Hill Co. Inc. New York, U. S. A.

Received for Publication: 14/05/2011

Accepted for Publication: 18/06/2011

Corresponding author

P.O.Ozung

Department of Animal Science, University of Calabar, Calabar – Nigeria,

E-mail address:pascalozung@yahoo.com